IN THE CLAIMS:

1. (Currently Amended) A system for monitoring and controlling a fabrication process comprising:

a plurality of fabrication subsystems that perform respective fabrication steps on a workpiece; and

a crystallographic analysis subsystem for acquiring crystallographic orientation, grain size, or grain morphology ~~crystallographic information~~ from the workpiece after the workpiece undergoes a fabrication step by at least a first subsystem, the crystallographic analysis subsystem coupled to one or more of the fabrication subsystems to provide information for modifying parameters associated with the respective fabrication steps.

2. (Original) The system of claim 1, further comprising a feedback path from the crystallographic analysis subsystem to at least the first subsystem for providing information to at least the first subsystem.

3. (Original) The system of claim 1, further comprising a feed-forward path from the crystallographic analysis subsystem to at least a second subsystem that performs a fabrication step after the first subsystem and after crystallographic analysis of the workpiece, the feed forward path providing information to at least the second subsystem.

4. (Original) The system of claim 1, the analysis subsystem further comprising a workpiece roughness characterization subsystem.

5. (Original) The system of claim 1, the analysis subsystem further comprising a workpiece reflectivity characterization subsystem.

6. (Original) The system of claim 1, the analysis subsystem further comprising a crystallographic characterization subsystem.

7. (Original) The system of claim 6, the crystallographic characterization system further comprising:

a workpiece holder for holding the workpiece for characterization of a workpiece area;

an electron source for generating an electron beam;

a scanning actuator for controlling the relative movement between the electron beam and the workpiece, the scanning actuator being controllable for directing the electron beam at a series of spaced apart points within the workpiece area;

a first processing system for generating crystallographic data based upon electron diffraction from the workpiece;

a second processing system configured for determining whether sufficient data have been acquired to characterize the workpiece area; and

a controller for controlling the scanning actuator to space the points apart such that acquired data is representative of a different grain within the workpiece.

8. (Original) The system of claim 6, the crystallographic characterization subsystem further comprising:

a workpiece holder for holding a crystalline workpiece;

a first ion source for generating a first ion beam;

a scanning actuator for controlling the relative movement between the first ion beam and the crystalline workpiece, the scanning actuator being controllable for directing the first ion beam at desired areas of the crystalline workpiece;

an electron detector for detecting secondary electrons emitted from the crystalline workpiece;

a first processing system for creating a contrast intensity image based upon secondary electron emissions from the crystalline workpiece;

a second processing system programmed to provide crystallographic information based on the contrast image intensity data; and

a controller for controlling the scanning actuator for scanning the first ion beam.

9. (Original) The system of claim 8, further comprising a second ion source for generating a second ion beam, the second ion source controllable by the scanning actuator.

10. (Original) The system of claim 6, the crystallographic characterization system further comprising:

a sample holder for holding a crystalline sample;

a first ion source for generating a first ion beam;

an electron source for generating an electron beam;

a scanning actuator for controlling the relative movement between the first ion beam, the electron beam, and the crystalline sample, the scanning actuator being controllable for directing the first ion beam at desired areas of the crystalline sample and for directing the electron beam at a series of points within the sample area;

an electron detector for detecting secondary electron emissions from the crystalline sample;

a first processing system for creating a contrast intensity image based upon secondary electron emissions from the crystalline sample and generating crystallographic data based upon electron diffraction from the crystalline sample;

a second processing system programmed to provide crystallographic information based on the contrast image intensity data and configured for determining whether sufficient data have been acquired to characterize the sample area; and

a controller for controlling the scanning actuator to direct the first ion beam at desired areas such that each ion channeling image is representative of channeling directions within the crystalline sample and to space the points apart such that acquired data is representative of a different grains within the crystalline sample.

11. (Currently Amended) A method for monitoring and controlling a fabrication process comprising:

coupling a plurality of fabrication subsystems that perform respective fabrication steps on a workpiece;

acquiring crystallographic orientation, grain size, or grain morphology ~~crystallographic information~~ from the workpiece after the workpiece undergoes a fabrication step by at least a first subsystem; and

providing information to one or more of the fabrication subsystems for modifying parameters associated with the respective fabrication steps.

12. (Original) The method of claim 11, further comprising providing, in a feed back path, information generated in the crystallographic analysis subsystem to at least the first subsystem at least the first subsystem.

13. (Original) The method of claim 11, further comprising providing, in a feed-forward path, information generated in the crystallographic analysis subsystem to at least a second subsystem that performs a fabrication step after the first subsystem and after crystallographic analysis of the workpiece.

14. (Original) The method of claim 11, further comprising characterizing a roughness of a workpiece.

15. (Original) The method of claim 14, further comprising:
measuring the reflectivity in different regions of the workpiece; and
generating a roughness characteristic based on the measured reflectivity.

16. (Original) The method of claim 11, further comprising characterizing a reflectivity of a workpiece.

17. (Original) The method of claim 11, further comprising characterizing a crystallography of a workpiece.

18. (Original) The method of claim 17, further comprising:

providing a workpiece holder for holding the workpiece for characterization of a workpiece area;

generating an electron beam;

controlling the relative movement between the electron beam and the workpiece for directing the electron beam at a series of spaced apart points within the workpiece area;

generating crystallographic data based upon electron diffraction from the workpiece;

determining whether sufficient data have been acquired to characterize the workpiece area; and

controlling the scanning actuator to space the points apart such that acquired data is representative of a different grain within the workpiece.

19. (Original) The method of claim 17, further comprising:

providing a workpiece holder for holding a crystalline workpiece;

generating a first ion beam;

controlling the relative movement between the first ion beam and the crystalline workpiece for directing the first ion beam at desired areas of the crystalline workpiece;

detecting secondary electrons emitted from the crystalline workpiece;

creating a contrast intensity image based upon secondary electron emissions from the crystalline workpiece;

providing crystallographic information based on the contrast image intensity data; and

controlling the scanning actuator for scanning the first ion beam.

20. (Original) The method of claim 17, further comprising:

generating a second ion beam; and

controlling the relative movement between the first ion beam, the second ion beam and the crystalline workpiece for directing the second ion beam at desired areas of the crystalline workpiece.

21. (Original) The method of claim 17, the crystallographic characterization system further comprising:

providing a sample holder for holding a crystalline sample;

generating a first ion beam;

generating an electron beam;

controlling the relative movement between the first ion beam, the electron beam, and the crystalline sample, the scanning actuator being controllable for directing the first ion beam at desired areas of the crystalline sample and for directing the electron beam at a series of points within the sample area;

detecting secondary electron emissions from the crystalline sample;

creating a contrast intensity image based upon secondary electron emissions from the crystalline sample and generating crystallographic data based upon electron diffraction from the crystalline sample;

providing crystallographic information based on the contrast image intensity data and configured for determining whether sufficient data have been acquired to characterize the sample area; and

controlling the scanning actuator to direct the first ion beam at desired areas such that each ion channeling image is representative of channeling directions within the crystalline sample and to space the points apart such that acquired data is representative of a different grains within the crystalline sample.